WHAT IS CLAIMED IS:

1. An optical to electrical or electrical to optical conversion assembly, comprising:

a substrate having a surface onto which components of said conversion assembly are attached; and

a flexible circuit operatively and electrically attached to said surface.

2. The conversion assembly of claim 1, wherein said components are selected from the group consisting of optical components and electrical components.

3. The conversion assembly of claim 1, wherein said conversion assembly is selected from the group consisting of an optical to electrical conversion assembly (OECA) and an electrical to optical conversion assembly (EOCA).

4. The conversion assembly of claim 3, wherein said conversion assembly comprises an optical wavelength division multiplexer and demultiplexer for single-mode or multi-mode fiber optic communication systems.

5. The conversion assembly of claim 3, wherein said surface comprises a low coefficient of thermal expansion.

6. The conversion assembly of claim 5, wherein said surface comprises a thermal conductivity rating of about at least 25 W/m K.

7. The conversion assembly of claim 6, wherein said surface comprises a ceramic material.

8. The conversion assembly of claim 7, wherein said ceramic material is selected from the group consisting of BeO, AlN, or Al_2O_3.

9. The conversion assembly of claim 8, wherein said components are attached to said surface utilizing a thick film process to deposit metal on said substrate for attachment of optical conversion circuits, routing of signals and gold bond wire attachment.

10. The conversion assembly of claim 8, wherein said substrate undergoes a subtractive etch process and then is copper plated.

11. The conversion assembly of claim 8, wherein said conversion assembly comprises said OECA, wherein electrical connections are made from said flexible circuit to said components with gold bond wire.

12. The conversion assembly of claim 8, wherein said conversion assembly comprises said EOCA, wherein electrical connections are made from said flexible circuit to said components with solder.

13. The conversion assembly of claim 1, wherein said flexible circuit is electrically attached to at least one component of said components to form an operation circuit, wherein said operation circuit comprises means for achieving low loss transmission of an electrical signal propagating on said operation circuit.

14. The conversion assembly of claim 13, wherein said means for achieving low loss transmission comprises a transmission media that is selected from the group consisting of coaxial cable, microstrip and stripline.

15. The conversion assembly of claim 14, wherein said transmission media comprises a transmission frequency within a range from 1 MHz to 20 GHz.

16. The conversion assembly of claim 13, wherein said means for achieving low loss transmission comprises a waveguide transmission media comprising a transmission frequency of at least about 500 MHz.

17. The conversion assembly of claim 13, wherein said means for achieving low loss transmission of an electrical signal propagating on said operation circuit are selected from the group consisting of reducing reflections, lowering absorptive loss, preventing cross talk between adjacent signal lines, reducing ringing and reducing standing waves that result from signal reflections.

18. The conversion assembly of claim 13, wherein said means for achieving low loss transmission comprises providing said operation circuit with a transmission line having a real transmission line impedance wherein capacitive and inductive effects of the conductor of said transmission line are cancelled out, wherein said transmission line has no imaginary impedance component.

19. The conversion assembly of claim 13, wherein said operation circuit comprises a transmission line, wherein a source and a load are operatively connected to said transmission line, wherein said source and said load each present an impedance to said transmission line that match the impedance of said transmission line.

20. The conversion assembly of claim 1, wherein said flexible circuit comprises a flexible layer.

21. The conversion assembly of claim 20, wherein a crosshatched ground plane is attached to said flexible layer.

22. The conversion assembly of claim 21, further comprising a conductive signal layer attached to said flexible layer on the opposite side of said flexible layer with respect to said cross hatched ground plane.

23. The conversion assembly of claim 22, further comprising an outer solder mask layer on said cross hatched ground plane and another outer solder mask layer on said conductive signal layer.

24. The conversion assembly of claim 20, wherein said flexible layer comprises polyimide.

25. The conversion assembly of claim 20, wherein said flexible layer comprises polyimide, wherein said polyimide is about .0020 inches thick.

26. The conversion assembly of claim 23, wherein at least one solder mask layer comprises a liquid photo imageable solder mask.

27. The conversion assembly of claim 13, wherein said operation circuit comprises a transmission line terminated with a VCSEL diode and series resistor such that the nominal impedance of said transmission line matches the combined impedance of said VCSEL and said series resistor.

28. The conversion assembly of claim 27, wherein said VCSEL is a current mode device and is powered by laser driver circuitry operating as a current source off of a fixed supply rail of 5V, wherein there is no additional total power loss with the use of said matching resistor, wherein power that would have been dissipated in the laser driver circuit if there were no matching resistor is now dissipated in said resistor.

29. A method of fabricating a ceramic substrate for use in an optical to electrical or electrical to optical conversion assembly, comprising:

providing a sheet of ceramic material;

lapping said sheet down to a desired thickness of about .035 inches;

drilling all necessary holes in said sheet;

cleaning and pre-firing said sheet in a convection oven that slowly ramps the material up to 850 to 900 degrees C;

applying a PdAg paste to said sheet;

baking said sheet at 100 to 150 degrees C to remove the solvents from said paste;

firing said sheet in a convection oven that slowly ramps the temperature to between 850 and 900 degrees C to anneal said paste;

allowing said sheet to cool;

printing gold pads and traces onto said sheet;

baking said sheet at 100 to 150 degrees C to remove the solvents from said gold pads and traces;

firing said sheet in a convection oven that slowly ramps the temperature to between 850 and 900 degrees C to anneal said gold pads and traces;

depositing a resistive paste is said ceramic surface in the required geometry; and

baking and firing said resistive paste.

30. A method of fabricating a flexible high speed transmission line for use in an optical to electrical or electrical to optical conversion assembly, comprising:

providing a sheet of about .002 inch thick polyimide material;

depositing and annealing copper on both sides of said sheet;

cutting all the required vias and holes in said sheet;

plating said sheet with copper to fill in said vias and holes;

strengthening the connections of said vias with an additional electroplated copper plating sequence;

applying dry film photoresist to both sides of said sheet;

applying negative image films of desired copper traces and cross hatched ground to both sides of the panel;

removing the resist from the areas where the copper is to be removed;

placing said sheet in an alkaline etching bath where unwanted copper is removed from said sheet and the remaining photoresist is then stripped away leaving copper only where traces and cross hatched ground are desired;

coating said sheet with liquid photoimageable solder mask;

placing said sheet in an oven at about 170 to 180 degrees C for about 15 minutes;

placing a negative image film of a solder mask layer on the top and bottom of said sheet and exposing said sheet to ultra violet light, wherein the areas exposed to the light are polymerized and become resistant to the developer;

placing said sheet in a developer bath, wherein the solder mask is removed from those areas of the board that were not exposed to the ultra violet light;

baking said sheet at about 300 degrees C for about 1 hour to completely cure said solder mask layers;

plating the exposed copper on said sheet using an electroless Nickel plating process; and

plating said sheet with gold.

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